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HARTCROWSER

Earth and Environmental Technologies

*Environmental Site Assessment
Desimone Trust Property
South Park, Seattle, Washington*

*Prepared for
Desimone Trust and
Northwest Properties Development Corporation*

*December 18, 1991
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**ENVIRONMENTAL SITE ASSESSMENT
DESIMONE TRUST PROPERTY
SOUTH PARK, SEATTLE, WASHINGTON**

INTRODUCTION

This report presents the results of our Phase I and Phase II environmental site assessment for the Desimone Trust property in the South Park area of Seattle, Washington. It is prepared for the Desimone Trust and Northwest Properties Development Corporation. Proposed development of the site requires that the owners exercise due diligence in determining if previous activities at or near the site have adversely affected the soil and groundwater quality at the site. This report provides the information and data analysis to document the potential for environment releases on the property and risks associated with development of the property.

Site Description

The site consists of approximately 11 acres in the South Park area located north of South 96th Street between 8th Avenue South and 5th Avenue South. The property is divided into two parcels, A and B, with a gravel road between them, as shown on Figure 1. Located on the west side of the Duwamish River drainage basin, the majority of both parcels slopes to the southeast at a 4 to 8 percent grade. The northern third of parcel B slopes to the north at approximately a 6 percent grade. The property is currently not in use and is covered with blackberry bushes and other low vegetation. Several older trees and shrubs exist in the vicinity of the former residence/farm.

PHASE I ENVIRONMENTAL ASSESSMENT

Historical Use of the Property

The property has been used as farmland ever since it was homesteaded by the Desimone family in the early 1900s. Kroll's Atlas of Seattle indicates that in 1920 Parcel B was owned by Giuseppe Desimone while Parcel A is referred to only as one of Moore's 5-Acre Tracts. By 1950, Kroll's Atlas shows farm buildings and a residence on Parcel A,

although the property is still referred to as Tract 13 of Moore's 5-Acre Tracts.

Aerial photos suggest that the farm and residence changed slightly over time, with the addition and removal of several outbuildings, until 1988 when the site was considered for further development. The farm buildings and house were demolished in 1990. All that remains are some underground utilities, an underground storage tank (probably gasoline or diesel fuel) located in the vicinity of the former barn, and an underground storage tank which probably contained heating oil.

Mr. Louis Gagliardi was identified as the last person to actively farm the property and he reported that he raised vegetables commercially on the property from 1964 to 1988.

The site is downhill from light industrial facilities to the west (Gilmore Door and Aero-Lac) and southwest (Ace Galvanizing). Industrial properties are also located to the south (Allied Body Works, Sealand Transport, and Penberthy Electromelt), and east (Advance Electroplating, Ocean Pride Seafoods, and Pure Water Corps). On the north, Parcels A and B are bounded by residential property. A recycling transfer station, machine shop, winery, and some agricultural land are located to the northwest of Parcel B.

Ace Galvanizing and Advance Electroplating have both been investigated recently by the Washington State Department of Ecology (Ecology) for soil and groundwater contamination related to their work and waste disposal practices. Aerial photos and Kroll's Atlas of Seattle indicate that Advance Electroplating was present in 1950 while Ace Galvanizing does not appear until a 1965 aerial photo.

Regulatory File Review

Hart Crowser contacted EPA Region 10 and Ecology for regulatory file information related to the site. We reviewed the following lists from those agencies to determine whether the subject property or adjacent facilities are identified:

- ▶ EPA National Priority List (NPL) (August 1991) - List of "Superfund" sites;

- ▶ EPA Region 10 CERCLIS (November 1991) - List of sites currently being reviewed by the EPA;
- ▶ EPA Region 10 RCRA Notifiers List (April 1991) - List of generators, transporters, and disposers of hazardous wastes;
- ▶ Federal Facility Index System (FINDS) List for the State of Washington (September 1991) - List of facilities for which there are files at Ecology or EPA;
- ▶ Ecology's Affected Media and Contaminants (AMC) List (September 1991) - List of sites currently being investigated by Ecology;
- ▶ Ecology's Underground Storage Tank (UST) Registration (January 1991) - List of underground storage tanks registered in the State of Washington;
- ▶ Ecology's Leaking Underground Storage Tank (LUST) Site List (June 1991) - List of reported leaking USTs in Washington; and
- ▶ Ecology's Hazardous Sites List and Notice of Hazard Rankings (November 1991) - List of Washington State sites that are being cleaned up under the Model Toxics Control Act (MTCA).

The subject property was not found on any of these reviewed lists. Ace Galvanizing and Advance Electroplating were, however, noted on all of the lists with the exception of the Region 10 National Priority List and Proposed NPL. Site assessments were conducted on these sites by Ecology during the spring of 1991. We contacted Ecology and obtained copies of the reports to aid us in designing an appropriate scope of work for this property.

Environmental Concerns from Previous Studies

Geotechnical Study of Property

Rittenhouse-Zeman and Associates (RZA) conducted a site assessment of the Desimone property in 1988 for Coastal Trailer Repair, Inc., to address geotechnical conditions (foundation and earthwork considerations) for development of the property for the proposed

"Coastal Repair Facility (RZA, 1988)." As part of this investigation, soil samples from test pits were submitted to an analytical laboratory for environmental testing. A sample obtained from a test pit excavated near the center of Parcel B revealed the presence of elevated levels of total chlorinated halogens. Further testing revealed the presence of elevated concentrations of methylene chloride (17.8 ppm) and 1,1,1-trichloroethane (14.7 ppm). The cause for the detection of these compounds was unknown.

Advance Electroplating

An environmental site assessment of Advance Electroplating was completed for Ecology by Parametrix in July 1991 (Parametrix and SAIC, 1991a). Parametrix reported that elevated levels of heavy metals and volatile organic chemicals were measured in soil and groundwater samples collected at the site.

Workers from Advance Electroplating reported in 1977 that drums filled with plating sludges had been buried on the east edge of the Desimone property. Based on this information, Ecology hired SAIC in 1991 to perform a geophysical survey over a section of the site in an attempt to locate any buried drums. Parametrix and SAIC (1991a) performed two electromagnetic surveys and a manometer survey and detected a 150-foot-long, north-south trending anomaly approximately 60 feet from the property boundary. Further exploration was not accomplished to determine the nature of the anomaly. It was believed that the anomaly probably represented either buried drums or buried irrigation lines.

Ace Galvanizing

An environmental site assessment of Ace Galvanizing was performed for Ecology by Parametrix, Inc., in June 1991. Parametrix and SAIC (1991b) reports that heavy metals, zinc primarily, were detected in the soil and groundwater samples collected and analyzed. Total petroleum hydrocarbon (TPH) was measured in some of the soil samples analyzed with a maximum concentration of 31,000 mg/kg. In groundwater, dissolved zinc was reported at a concentration 1,420,000 ug/L, dissolved nickel at 5,600 ug/L, and dissolved cadmium was reported at a concentration of 126 ug/L. In addition to the heavy metals detected in the groundwater, methylene chloride was found at concentrations up to

16 $\mu\text{g/L}$. Of particular concern was the potential that groundwater beneath Ace Galvanizing may migrate toward the Desimone property.

Mr. Louis Gagliardi reported that thick black smoke from Ace Galvanizing used to blow over the Desimone property and there was some concern as to degradation of the soil quality in the farm fields. Mr. Gagliardi also stated that in 1975 or 1976 Ace Galvanizing collected soil samples from the fields for chemical analysis, but that he never learned the results. He reported that the thick smoke was no longer released from the facility after the testing.

WORK PLAN FOR PHASE II INVESTIGATION

The Phase II scope of work was designed to evaluate the soil and groundwater conditions at the site with an emphasis on investigating the areas of the site and the surrounding area described as potential problems by previous studies. The potential concerns with regard to soil and water quality that formed the basis for our scope of work included:

- ▶ Nature and extent of elevated concentrations of chlorinated solvents near the center of Parcel B;
- ▶ Site contamination due to past activities at Advance Electroplating;
- ▶ Potential for buried drums of plating wastes along the eastern boundary of the site; and
- ▶ Site contamination due to contaminant migration from Ace Galvanizing.

Our scope of work included soil borings, the installation of four monitoring wells, soil and groundwater sampling and analysis, and groundwater flow analyses. The specific locations and objectives of our field program included:

- ▶ Installing one monitoring well and drilling two soil borings near the location of RZA's test pit TP-8 to test soil and groundwater for methylene chloride, trichloroethane, and other associated volatile organic compounds;

- ▶ Installing two monitoring wells along the east edge of the property, next to Advance Electroplating, to evaluate soil and groundwater quality which may have been affected by past waste disposal practices either on the property or at Advance Electroplating;
- ▶ Excavating four test trenches in the area of the geophysical anomaly, detected by Ecology and SAIC, to verify the nature and extent of the anomaly;
- ▶ Installing one monitoring well in the southwest corner of the property to evaluate soil and groundwater quality which may be affected by activities at Ace Galvanizing; and
- ▶ Collecting soil samples from each boring and groundwater samples from each completed monitoring well for soil characterization and chemical analysis.

HYDROGEOLOGIC CONDITIONS

The site is located in the Duwamish River valley approximately 1.5 miles west-southwest of the river. The valley was carved during the Pleistocene by glaciers advancing south from British Columbia (Liesch et al., 1963). Sediments filled the valley as the glaciers retreated and later as the Duwamish reworked glacial deposits and carried soils toward Puget Sound. Relatively steep walls on uplands and a broad alluvial plain with local topographic highs characterize the valley in the vicinity of the site.

Complex meanders of the Duwamish River, flooding, and reworking of older glacial sediments have created sandy alluvial soils with discontinuous silt and clay layers. These soils have been mapped as Vashon Recessional Outwash (EES et al., 1991) and as Alluvium (Sweet Edwards and Harper Owes, 1985). The Vashon Recessional Outwash is described as well-sorted sand and gravel deposits. The description of alluvium, however, as chiefly sand and silt with some clay and peat, more closely describes the soils encountered during our explorations.

Shallow groundwater in the valley will generally flow from the uplands toward the river. Locally groundwater may flow in other directions preferentially through more permeable fill materials or in old river

channels that were filled during the rerouting of the Duwamish during the late 1800s and early 1900s. Groundwater in deeper aquifers (greater than 100 feet below ground surface) most likely flows parallel to the river.

Subsurface Soils

Soils beneath the property are described based on the drilling and soil sampling in two soil borings and four monitoring wells. Overall, the site soils consist of predominantly sand to silty sand with interbeds of silt. The material type and the relative density suggest these are alluvial soils of the Duwamish River. The location of the borings (B-1 and B-2) and the monitoring wells (MW-1 through MW-4) are shown on Figure 1.

Soils observed at the surface on the site during drilling consisted generally of medium dense, dry, brown, silty sand to a depth of 3 to 5 feet. In the boring for MW-2, in the southwest corner of the site, a very loose, dry, brown, medium sand was observed at the surface and extended to a depth of approximately 35 feet. Below the silty sand, the soils in borings, other than MW-2, varied considerably. For more detail, see the generalized geologic cross section on Figure 2 and the boring logs on Figures A-2 through A-7 in Appendix A.

In the boring for MW-1, a medium dense, damp, brown sand extended from a depth of 4 feet to a depth of 8.5 feet. A medium dense, damp, brown, slightly silty sand was observed between the depths of 8.5 and 9.5 feet. Below the depth of 9.5, feet a medium dense, brown, fine to medium sand extended to the total depth of the boring at 42 feet. Soils observed in boring B-2, located 50 feet to the northeast of MW-1, were nearly identical to those in MW-1.

In boring MW-2, a medium dense, damp, brown, fine to medium sand extends from the surface to a depth of 35 feet. Below the sand a medium dense, damp, brown, slightly silty sand was observed between the depths of 35 and 41 feet. Very stiff, wet, brown, slightly gravelly silt extended from 41 feet to approximately 41.5 feet, below which a medium dense, wet, brown, slightly silty sand extended to a depth of 45 feet. Silt was encountered at 45 feet below the ground surface.

In the borings for MW-3 and MW-4, the dry, brown, silty, sand extended to a depth of 4 feet below which a medium dense, damp,

brown sand extended to a depth of 10 feet. Between the depths of 10 and 15 feet, interbedded silt and sand layers of varying thicknesses were observed. A medium dense, wet, brown, slightly silty sand extended to the total depth of exploration of 20.5 feet.

Loose, dry, brown, slightly silty sand extended to a depth of 5.5 feet in boring B-1. Below 5.5 feet, several 1-foot-thick layers of stiff, brown, sandy silt were interbedded with loose to medium dense, brown sand. The interbedded soils extended from the depth of 5.5 feet to the total depth of exploration of 11.5 feet.

Groundwater Occurrence and Flow

Groundwater was encountered at a depth of 35 and 39 feet below ground surface on Parcel B, in wells MW-1 and MW-2, respectively. The depth to water is shallower on the eastern edge of Parcel A at a depth of approximately 12 feet, as measured in wells MW-3 and MW-4. Measurements of the groundwater gradient across the site indicate that groundwater flows almost directly east toward the Duwamish Waterway. The magnitude of the gradient increases from 0.004 ft/ft across Parcel B to 0.005 ft/ft across Parcel A. The gradient increases to 0.01 feet just east of Parcel A beneath the Advance Electroplating property. The increase in gradient may be related to the occurrence of finer grained soils in the vicinity of MW-3 and MW-4 and east of Parcel A.

Water levels measured at Ace Galvanizing southwest of the site suggest that groundwater flows from Ace Galvanizing toward the Desimone property. Groundwater was encountered at Ace approximately 20 feet higher in elevation than the groundwater encountered in MW-2, the closest Desimone well to the Ace property. The wells are approximately 200 feet apart. Comparison of geologic logs as presented on Figure 2 suggests that the Ace Galvanizing well may be screened in a zone of perched water above a silt bed. Water from this shallow perched zone likely flows downward toward the deeper aquifer encountered on the Desimone property. Although a horizontal flow direction cannot be determined from the available data, it is likely to follow an easterly direction similar to the deeper water table aquifer. A steep hydraulic gradient of 0.1 ft/ft occurs between the groundwater tapped by the Ace well and our well, MW-2.

GEOPHYSICAL ANOMALY IS IRRIGATION PIPE

Backhoe excavations performed under the supervision of Hart Crowser uncovered a 2-1/2-inch-diameter, rusted, metal irrigation pipe, along the eastern edge of Parcel A. The pipe corresponds in general to the location, shape, and size of the geophysical anomaly reported by Ecology in the Advance Electroplating site and assessment. No drums were encountered during the excavation. Figure 3 depicts the location of the geophysical anomaly, the pipe location, and our test trenches.

Soil in the test trenches was a dry, brown, silty sand loam with grasses to a depth of approximately 2 feet. A silty, fine sand with occasional gravel was observed from a depth of 2 feet to the total depth of exploration of 4 feet.

CHEMICAL ANALYSIS RESULTS

Soil and water samples collected at the property were analyzed for volatile organic compounds and heavy metals. Laboratory reports of analysis are presented in Appendix B and a summary table of results is presented in Table 1. Duplicate samples were collected for quality control and labeled with a "D" to differentiate them from the initial samples.

For a complete description of sampling methods, refer to Appendix A.

Soil Chemistry

Methylene chloride was measured as laboratory contamination in all the soil samples analyzed. It was the only volatile organic compound detected in the samples. Methylene chloride was measured in the sample blank at a concentration of 0.17 mg/kg. If the concentration of a compound in a sample is less than 5 times the concentration measured in the sample blank (85 mg/kg), the compound detected in the sample is considered to be laboratory contamination and flagged with the letter B. All of the soil samples analyzed were well below 5 times the laboratory blank.

Slightly elevated concentrations of zinc, cadmium, and mercury were measured in several samples collected from across the site. Zinc was

found in a soil sample collected just above the water table in the boring for MW-2 at a concentration of 498 mg/kg. Zinc, at a concentration of 68.3 mg/kg, which seems to be above background concentrations on the site, was measured in sample MW-1, S-1, taken at a depth of approximately 6 inches. Sample MW-1, S-1 also had concentrations of 3.3 mg/kg cadmium and 1.1 mg/kg mercury. Cadmium was measured at a concentration of 3.3 mg/kg in soil collected from a depth of 10.5 feet in the boring for MW-4.

Water Chemistry

Several volatile organics were measured in water samples collected from the on-site wells. Benzene and toluene were detected at the relatively low concentrations of 4 and 5 ug/L, respectively, in MW-2. Benzene was detected at 3 ug/L and toluene at 4 ug/L in the quality control duplicate from MW-2. Acetone and methylene chloride, common laboratory contaminants, were both measured in the sample blank at concentrations of 16 ug/L and 10 ug/L, respectively. For this reason the low concentrations of acetone and methylene chloride in samples collected from MW-3 and MW-4 are considered laboratory contamination and flagged with a B.

Dissolved metals were detected in all the water samples collected on the site. Zinc was the only metal detected in all the water samples with concentrations ranging from 132,000 ug/L in MW-2D to 60 ug/L in MW-4. Nickel and cadmium were measured in well MW-2 at concentrations of 320 ug/L (MW-2D) and 15 ug/L (MW-2D), respectively. Copper was detected in samples collected from MW-1, at a concentration of 20 ug/L, and MW-2, at a concentration of 90 ug/L.

MTCA SCREENING CRITERIA

The Model Toxics Control Act (MTCA; WAC 173-340-740) currently sets cleanup levels for remediation of soil and water contamination within the State of Washington. The MTCA defines several cleanup levels, Methods A, B, and C, each with differing requirements and applicability. Method A provides cleanup levels for screening residential and industrial sites. Method B defines cleanup levels based on detailed risk assessment calculations and comparisons with applicable state and federal laws. Method C provides conditional cleanup levels

when Method A or B levels are not achievable (e.g, due to technical infeasibility).

Due to the relatively clean nature of this site, we have used the MTCA Method A groundwater cleanup level for screening purposes. Several of the chemicals detected on site, however, have no Method A cleanup level (zinc for example). In those cases we have applied Method B criteria, which include an evaluation of the applicable regulatory requirements for groundwater protection. These requirements included the EPA's National Primary and Secondary Drinking Water Regulations, and Washington State's surface water protection criteria. Cleanup levels and exposure criteria for calculating MTCA Method B groundwater values are listed in Table 2.

Metals Detected in Soils

Concentrations of metals in the soils on site were generally below the MTCA Method A and B cleanup levels except for cadmium and mercury. A cadmium concentration of 3.3 mg/kg was noted in two soil samples, MW-1, S-1 (0 to 0.5 foot) and MW-4, S-4 (10.5-11 feet). These detections were only slightly above the MTCA cleanup level of 2 mg/kg. Based on the rest of the data collected on site it appears that average natural background concentrations on the property are in the range of 2.5 mg/kg. Cadmium slightly above background concentrations probably represents variation around the mean. As there is no history of cadmium usage or spills on this site it is unlikely that any action would be required.

Although mercury was detected at 1.1 mg/kg in the shallow soil at MW-1, it is not at a concentration requiring action. The MTCA regulations consider only 1 significant digit of the detected concentration. Thus the mercury data are essentially equivalent to the MTCA cleanup level of 1 mg/kg.

Metals Detected in Groundwater

Dissolved zinc and cadmium in groundwater sampled from MW-2 are above the Method B cleanup level, the federal drinking water Maximum Contaminant Level (MCL), and the chronic freshwater protection level. The concentration of zinc (132,000 ug/L) is two orders of magnitude over the MTCA Method B cleanup level of 3,200 ug/L and the MCL of

5,000 ug/L. Cadmium, at a concentration of 15 ug/L, is three times greater than the Method B cleanup level of 5 ug/L and the freshwater protection level of 4.3 ug/L. Nickel is at or below the Method B level of 320 ug/L but above the freshwater protection level of 27 ug/L. There is currently no MCL for nickel.

As there is no history of past usage of, or spillage of, the contaminants which were detected at concentrations above MTCA cleanup levels, it is not necessary to report this information to Ecology. The contamination is most likely coming from Ace Galvanizing and Ecology is already aware of their soil and groundwater problems. The first step in any effective cleanup of groundwater contamination on the Desimone property would be source control and remediation at the Ace Galvanizing property.

SUMMARY OF FINDINGS

No Volatile Organics Detected

The initial discovery of methylene chloride and 1,1,1-trichloroethane by RZA in the vicinity of test pit TP-8 was not confirmed by our soil sampling and testing. Methylene chloride was detected in the samples analyzed as a laboratory contaminant only. It is possible the previous detections during the RZA geotechnical investigation also resulted from laboratory contamination.

Low Levels of Metals in Soil

Slightly elevated concentrations of cadmium and mercury were measured in soil samples collected in MW-1, B-1, and B-2 but they probably reflect natural background conditions or applications of pesticides or fungicides in the past. Zinc concentrations in near-surface soils (MW-1, S-1) may represent air fall from the black smoke reported by Mr. Louis Gagliardi. The low levels of the detected metals should not present any human health or environmental risks from development of the property.

No Soil or Groundwater Contamination from Advance Electroplating

Soil and water samples collected from MW-3 and MW-4 on Parcel A indicate that Advance Electroplating has had no adverse impact on the environmental quality of the Desimone property. Concentrations of the metals in soil samples appear to be at background levels. Cadmium background levels appear to be slightly elevated on this property relative to other soils in the Puget Sound area. There is no evidence of a mechanism to uniformly spread cadmium throughout the soil column, from the surface to a depth of 41 feet.

No Buried Drums

No buried drums were found in the area where former employees of Advance Electroplating reported them to exist. Excavations through the geophysical anomaly reported by Parametrix in the site assessment report discovered a rusted, metal irrigation line.

Groundwater Contaminated Locally by Ace Galvanizing

Groundwater contamination reported at Ace Galvanizing appears to have impacted soil and groundwater quality in the southwest corner of the Desimone property. Zinc, nickel, and cadmium were detected in groundwater at MW-2 at concentrations above MTCA groundwater cleanup levels, and zinc was detected in the soil at a depth of 40 feet within the aquifer at the same location. These three metals are the same metals detected at very high concentrations in groundwater beneath the Ace Galvanizing property. These chemical data coupled with the strong hydraulic gradient between the groundwater tapped at Ace Galvanizing and that sampled beneath the southwest corner of the Desimone property indicate the metals contamination at Ace is migrating onto the Desimone property.

Metals contamination was not detected in other wells located on the Desimone property. With the exception of low levels of zinc, the other metals were not detected in monitoring wells MW-3 and MW-4 which are downgradient from MW-2 and Ace Galvanizing. It is not known whether the contamination has not yet reached this location or if substantial attenuation of the metal concentrations occurs between the west and the east areas of the property. Metals are readily adsorbed onto soil particles so it is possible the metals are attenuated within the

aquifer to below levels of concern before reaching the eastern property area. The high zinc levels detected in the aquifer soil at MW-2 indicate this soil adsorption phenomenon.

The pathways for potential impacts from these metals to human health or the environment is through the discharge of groundwater to surface water bodies or the use of the water for drinking purposes. Groundwaters from the site ultimately discharge to the Duwamish River which is approximately 1.5 miles from the site. The downgradient wells show no metals contamination so there should be no impacts on surface water from site discharges. It is unlikely the groundwater is used for water supply locally and nickel and zinc are not particularly hazardous to human health. Restriction of groundwater use on the property for drinking purposes is advised. This should not affect the planned development of the property for warehouse/distribution purposes.

RECOMMENDATIONS

Soil on the property appears to have no contamination requiring remediation or removal. The only significant contamination detected on the property during our assessment was found in the groundwater in southwest corner of the property at a depth of approximately 40 feet below ground surface. There does not appear to be any significant potential for impacts to human health or the environment from this contamination; however, it is advisable to attempt to limit any worsening of the problem. This concern should not affect the development plans for the property. We do, however, recommend the following:

- ▶ Provide this report to Ecology on a good neighbor basis to aid them in the cleanup and control of contamination at Ace Galvanizing;
- ▶ Maintain the monitoring wells on the site during any commercial development for the purpose of monitoring any changes that occur; and
- ▶ Contact Ace Galvanizing to inform them of impacts to your property and to indicate your interest in their plans for remediation on their property.

INFORMATION LIMITATIONS

Work for this project was performed, and this report prepared in accordance with generally accepted professional practices for the nature and condition of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of the Desimone Trust and Northwest Properties Development Corporation. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

It should be noted that Hart Crowser relied on verbal information provided by individuals indicated above. Hart Crowser can relay this information but cannot be responsible for its accuracy or completeness.

The state MTCA is currently one of the most complex and comprehensive sets of cleanup standards for land properties in the nation. As with any new regulation, it is not entirely clear how they will be interpreted and implemented in certain cases. For these reasons, we have selected likely MTCA cleanup levels for use in identifying potential problem areas on the site. As per our discussion, we used MTCA Method A levels except where no Method A criteria existed. In those cases we used Method B criteria and other applicable state and federal regulations.

The MTCA cleanup levels included in this report are used for screening and comparison purposes only and are based on our understanding of cleanup levels required by Ecology for similar projects. This comparison does not represent an interpretation of final MTCA cleanup standards for the site, since such standards are established by Ecology through a negotiation and public approval process. It should be understood that the MTCA Method B screening numbers were calculated using, to the best of our knowledge, the most current toxicity criteria available from EPA and Ecology. These criteria are continually being updated by EPA; and, as a result, the MTCA Method B levels used for screening purposes in this report may not be applicable for future use.

Any questions regarding our work and this report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the undersigned.

We trust that this report meets your needs.

Sincerely,

HART CROWSER, INC.



WILLIAM PEPLINSKI
Sr. Staff Hydrogeologist



LORI HERMAN
Associate

WP:cmj
Nortprop.rpt

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Table 1 - Results of Chemical Analyses of Soil and Groundwater Samples

Soil Sample Number	MW-1, S-1	B-1, S-1	B-2, S-2	MW-2, S-7	MW-3, S-1	MW-4, S-4	MW-4, S-4D	TT-4	BLANK
Depth in Feet	0-0.5	2.5-4	5-6.5	40-41.5	3-4.5	10.5-11	10.5-11	1.6	NA
VOLATILE ORGANIC COMPOUNDS (Method 8010) in mg/kg									
Methylene Chloride	0.45 B	0.13 B	0.15 B	0.21 B	0.12 B	0.21 B	0.82 B	0.17 B	0.17
TOTAL METALS in mg/kg									
Arsenic	6.8	1.9	2.4	2.8	3.9	5.3	3.3	4.2	NA
Cadmium	3.3	2.1	2.1	2.1	2.4	3.3	2.4	2.7	NA
Chromium	32.1	27.8	25.9	21.9	29.3	29.4	23.1	25.6	NA
Copper	31	10.7	10.7	13.4	16.7	26.6	16.6	12.5	NA
Mercury	1.1	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Nickel	33	38.4	40.3	31.4	35.6	44.9	34.7	33.4	NA
Lead	20.8	3.1	3.7	3.6	9.3	4.6	3.7	6.5	NA
Zinc	68.3	29.3	23.4	498	55.2	45.3	30.9	32.3	NA

Well Number	MW-1	MW-2	MW-2D	MW-3	MW-4	BLANK
VOLATILE ORGANIC COMPOUNDS (Method 8240) in ug/L						
Acetone	10 U	10 U	10 U	10 U	12 B	16
Benzene	1 U	4	3	1 U	1 U	1 U
Methylene Chloride	5 U	5 U	5 U	3 JB	4 JB	10
Toluene	1 U	5	4	1 U	1 U	1 U
DISSOLVED METALS in ug/L						
Arsenic	2 U	2 U	2 U	2 U	2 U	---
Cadmium	5 U	14	15	5 U	5 U	---
Chromium	10 U	10 U	10 U	10 U	10 U	---
Copper	20	60	90	10 U	10 U	---
Mercury	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	---
Nickel	10 U	260	320	10 U	10 U	---
Lead	2 U	2 U	2 U	2 U	2 U	---
Zinc	100	106,000	132,000	100	60	---
FIELD PARAMETERS						
Temperature in degrees C	13	13	13	13	13	NA
pH	6.6	6.0	6.0	5.8	6.1	NA
Conductivity in umhos	260	940	940	200	200	NA

Notes:

- U Analyte of interest was not detected, at the detection limit indicated.
- J Value should be regarded as an estimate
- B Analyte of interest was detected in the method blank associated with the sample as well as in the sample itself.
- NA Not analyzed

Table 2 - Soil and Water Cleanup Levels

Soil Cleanup Levels	Applied Cleanup Level in mg/kg	MTCA Method	Method B Oral Reference Dose in mg/kg-day
VOLATILE ORGANIC COMPOUNDS			
Methylene Chloride	0.5	A	---
TOTAL METALS			
Arsenic	20	A	---
Cadmium	2	A	---
Chromium	100	A	---
Copper	2900	B	0.037
Mercury	1	A	---
Nickel	1600	B	0.02
Lead	250	A	---
Zinc	16000	B	0.2

Water Cleanup Levels	Applied Cleanup Level in ug/L	MTCA Method	Method B Oral Reference Dose in mg/kg-day	Drinking Water MCL in ug/L	EPA Freshwater Criteria* in ug/L
VOLATILE ORGANIC COMPOUNDS					
Benzene	5	A	---	5	---
Methylene Chloride	5	A	---	---	---
Toluene	40	A	---	---	---
DISSOLVED METALS					
Arsenic	5	A	---	50	NC
Cadmium	5	A	---	10	0.66
Chromium	50	A	---	100	NC
Copper	595	B	0.037	1000	6.5
Mercury	2	A	---	2	NC
Nickel	320	B	0.02	---	87.7
Lead	5	A	---	50	NC
Zinc	3200	B	0.2	5000	58.9

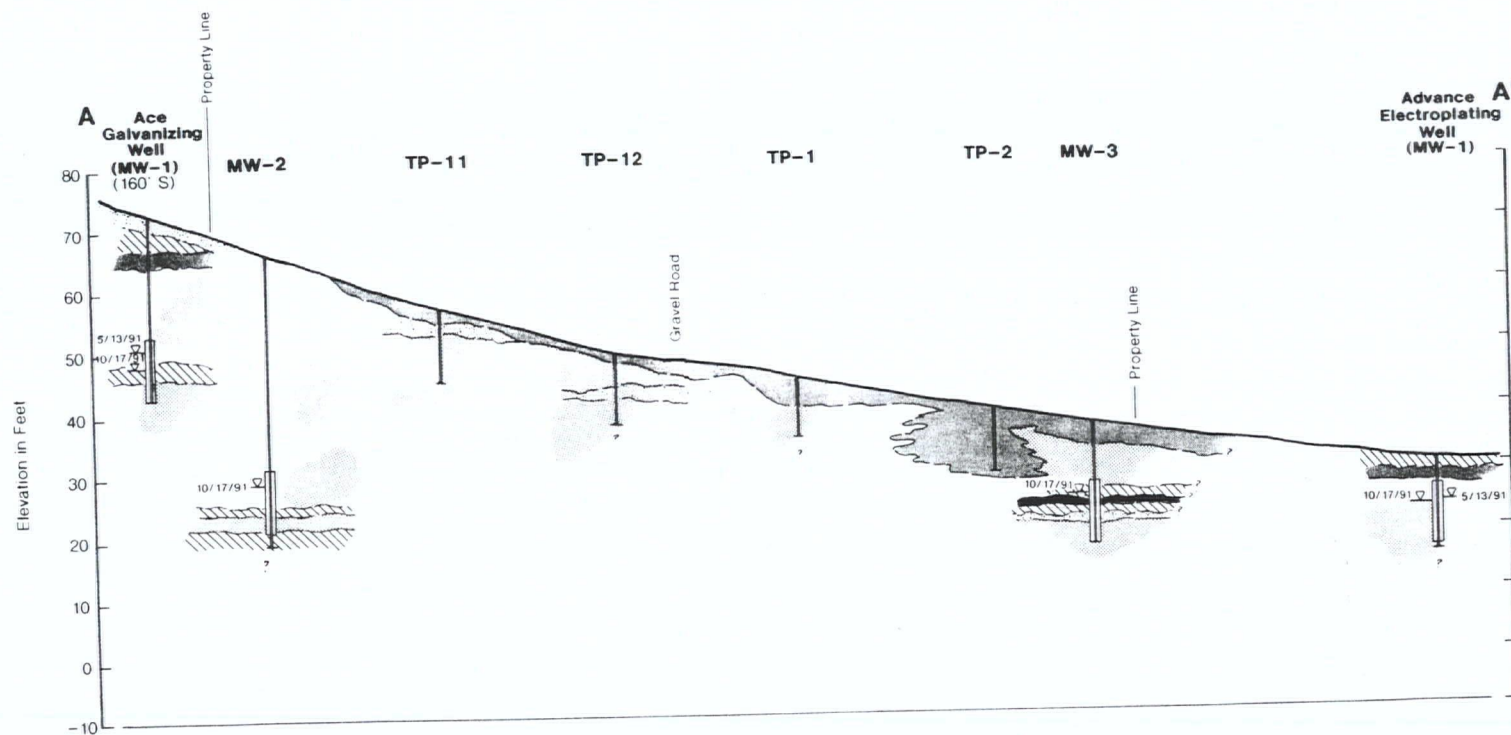
MTCA Method B values are based on the stated oral reference dose for a 16-kg child drinking groundwater. Toxicology data was current November 21, 1991.

--- Value does not exist.

* Criteria are dependent on hardness of freshwater of concern. In this example a hardness of 50 mg/L was used.

NC Value was not calculated.

Generalized Geologic Cross Section A-A'



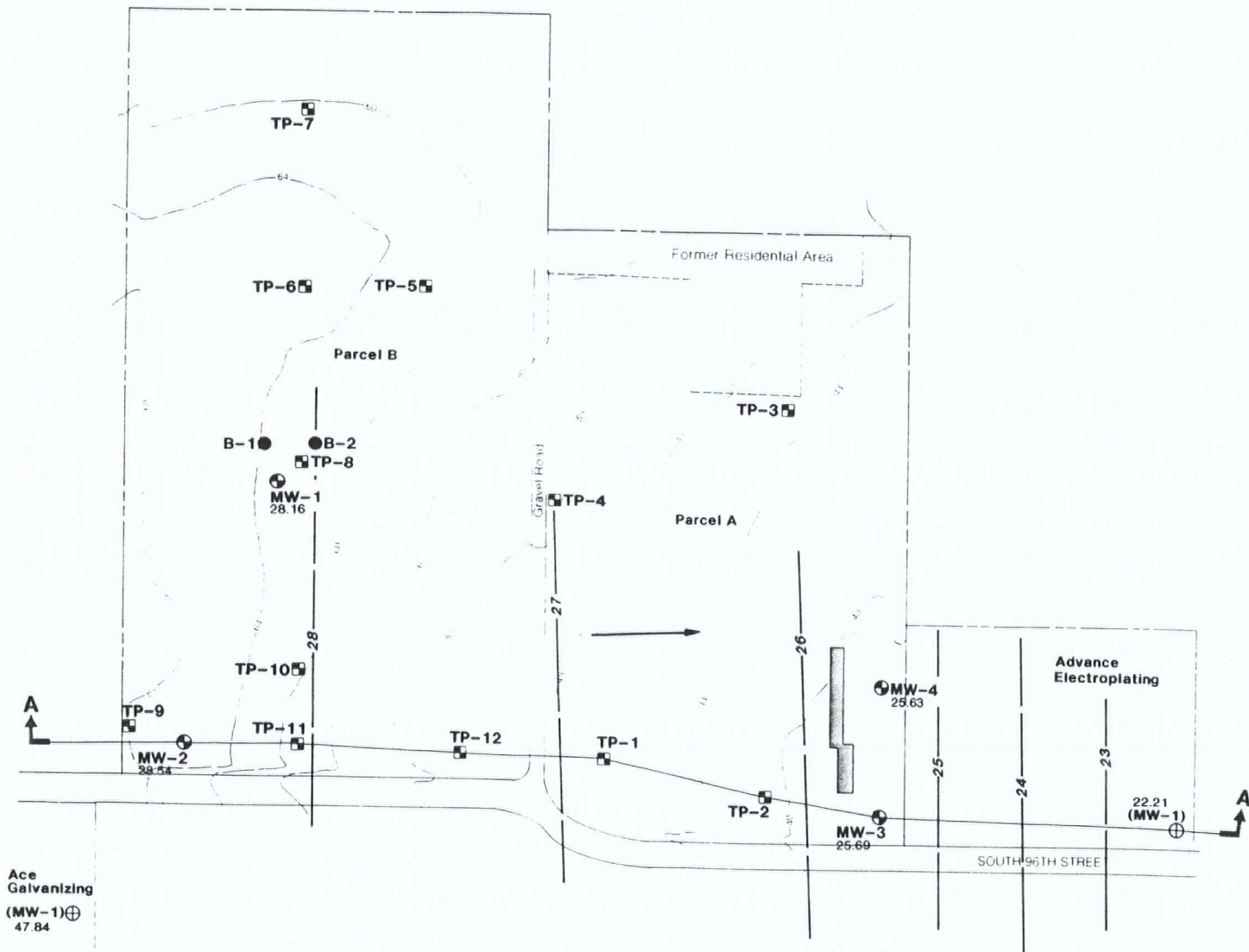
MW-2 Monitoring Well Number
TP-1 Test Pit Number
 (160' S) Offset Distance and Direction
 Exploration Location
 Groundwater Level
 Screened Interval

- Very loose to medium dense, SAND and slightly silty SAND
- Medium stiff to stiff, gray SILT and CLAY
- Loose to medium dense, brown, silty SAND
- Medium dense, to dense brown, gravelly SAND with a trace of Silt
- Medium dense and medium stiff, brown-green interbedded SAND and SILT

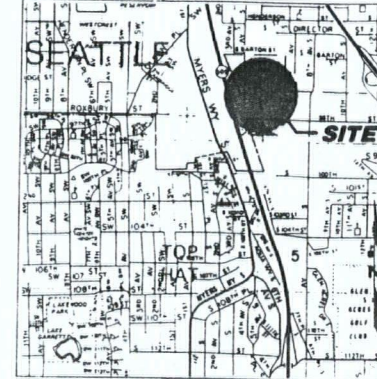
Vertical Exaggeration x 5
 Vertical Scale in Feet
 0 20 40
 0 100 200
 Horizontal Scale in Feet

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 Figure 2

Site and Exploration Plan



Vicinity Map



0 1/2 1
Scale in Miles

- MW-1** Monitoring Well Location and Location (Hart Crowser)
- MW-1** Monitoring Well Location and Number (Parametrix and SAIC, 1991a, 1991b)
- B-1** Boring Location and Number (Hart Crowser)
- TP-1** Test Pit Location and Number (Rittenhouse-Zeman and Associates, 1988)
- 28.16** Groundwater Elevation in Feet
- AA** Cross Section Location and Designation
- Approximate Groundwater Flow Direction
- 23 -** Groundwater Elevation Contour in Feet
- Zone of Geophysical Anomaly**

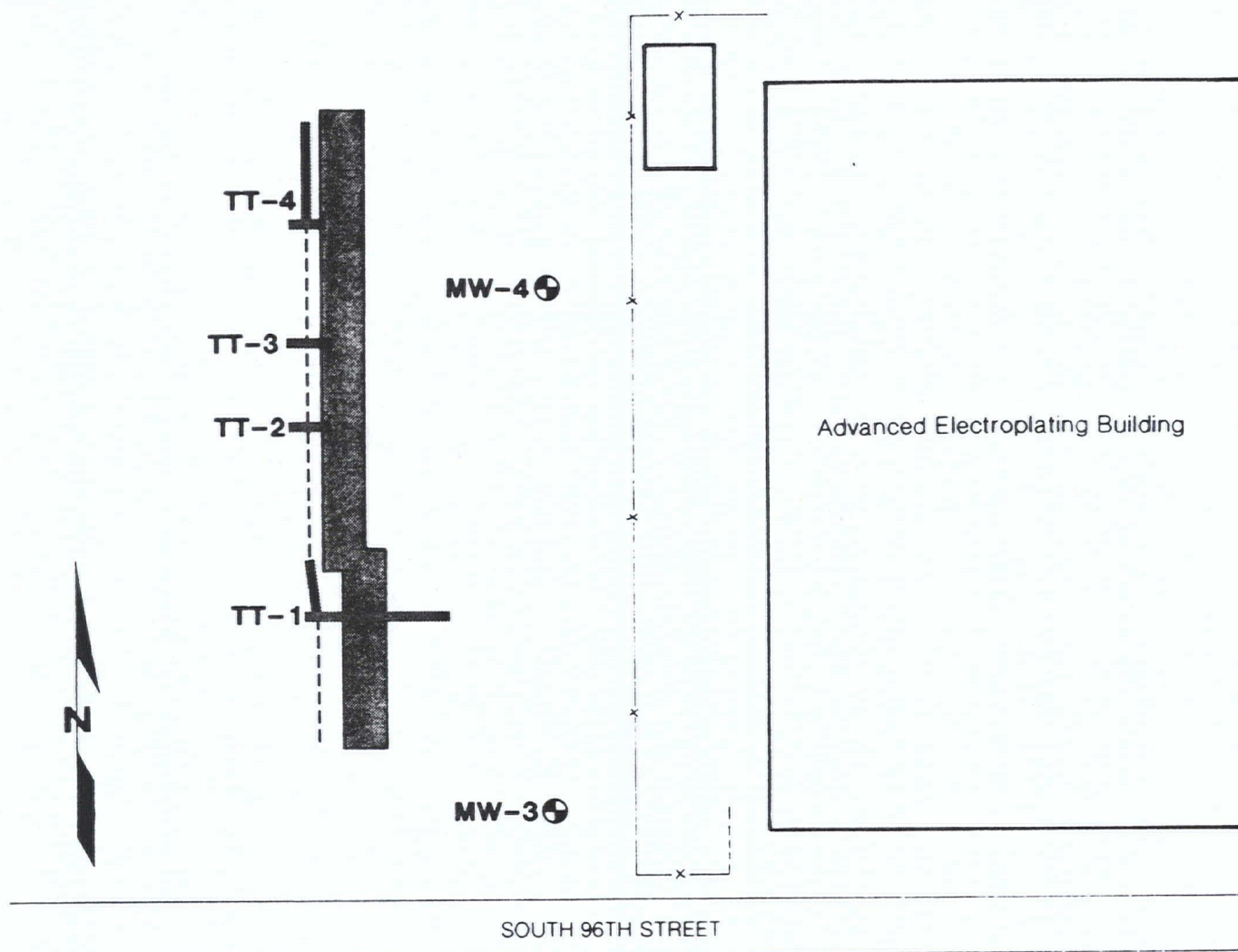
0 100 200
Scale in Feet



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Figure 1

Note: Base map prepared from drawing provided by Northwest Engineering Company entitled "Topographic Survey for Coastal Trailer Repair Inc." dated December 01 1988

Area of Geophysical Anomaly and Test Trench Exploration Plan



- TT-1** Test Trench Location and Number
- ⊕MW-3** Monitoring Well Location and Number
- Location of 2-1/2-inch-diameter Metal Pipe
- Zone of Geophysical Anomaly as Reported by Parametrix and SAIC (1991a)

0 40 80
Scale in Feet